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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/756,829

01/14/2004

Robert John Socha

55071-328

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09/26/2008

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EXAMINER

MEMULA, SURESH

ART UNIT

PAPER NUMBER

2825

MAIL DATE

DELIVERY MODE

09/26/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/756,829	Applicant(s) SOCHA ET AL.	
	Examiner SURESH MEMULA	Art Unit 2825	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 June 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7, 10, 11 and 19-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 10, 11 and 19-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This FINAL office action is a response to the amendments and remarks filed on 06/13/2008. The remarks are not persuasive; therefore, the rejections based on the prior arts of record, Aleshin and Liebchen, are maintained. Claims 1-7, 10-11, and 19-22 are pending, of which claims 19-22 are newly added.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. **Claims 1-7, 10-11, and 19-22 are rejected under 35 U.S.C. 103(a)** as being unpatentable over US Patent No. 6,263,299 to Aleshin et al. (Hereinafter: Aleshin) in view of:

US Pub. No. 2002/0062206 to Liebchen (Hereinafter: Liebchen).

3. Pursuant to claim 1 and similarly recited claim 10, **Aleshin teaches:**
representing at least one resolvable feature of a mask to be printed on the substrate (Column 5, lines 1-2; Column 8, lines 28-32) by at least one impulse function (Column 5, lines 5-18; Column 14, lines 51-55);
creating an interference map of an interference map (Column 4, lines 61-63; FIG. 4, 8) based on the at least one impulse function and a Hopkins model (Column 5, lines 5-18); and

a program product, machine readable medium, and programmable computer (FIG. 10).

4. Although Aleshin teaches a Hopkins model is utilized in the generation of an aerial image (Column 5, lines 5-18), **Aleshin does not explicitly teach the TCC function itself.**

5. **Liebchen teaches** the Hopkins model is a two-dimensional by two-dimensional transmission cross coefficient function which captures all the effects of the lithographic

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projection apparatus (¶9) including illumination pupil and projection pupil (¶7, 9; FIG. 1A).

6. **It would have been obvious** to one of ordinary skill in the art at the time of the Applicant's invention to have combined the teachings of Aleshin with Liebchen to utilize a TCC function in order to:

- a. more fully detail the composition of the Hopkins model utilized by several commercially available products that calculate aerial images (Liebchen: ¶9);
- b. maintain a reasonable degree of accuracy (Liebchen: ¶10)
- c. implement performing image formation analysis in the frequency space in order to deal with the pupil function of the imaging system (Liebchen: ¶7); and
- d. overcome the necessity to superimpose and add the effect of each individual illumination source that makes up the partially coherent source (Liebchen: ¶9).

7. Pursuant to claim 2 and similarly recited claim 11, placing an assist feature in the mask corresponding to the areas of destructive interference map (Liebchen: ¶254; Aleshin: Column 4, lines 9-15).

8. Pursuant to claim 3, wherein the assist feature is non-resolvable (Liebchen: ¶254; Aleshin: Column 4, lines 9-15).

9. Pursuant to claim 4, wherein the interference map models light intensity incident on the substrate (Liebchen: ¶ 3, 17; Aleshin: Column 4, lines 52-67).

10. Pursuant to claim 5, further comprising placing at least one assist feature on an area of the mask (Liebchen: ¶ 254; Aleshin: Column 4, lines 9-15) corresponding to an area on the interference map having a light intensity of a predetermined level (Liebchen: ¶ 1, 3, 212, 240, 251, 253-0254) corresponding to the areas of destructive interference (Liebchen: ¶ 1, 3, 243).

11. Pursuant to claim 6, wherein the predetermined level corresponds to a resolvable light intensity (Liebchen: ¶1, 3, 254; Aleshin: Column 4, lines 9-15).

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12. Pursuant to claim 7, wherein the interference map represents change in light intensity incident on the substrate (Liebchen: ¶1, 3, 17; Aleshin: Column 4, lines 52-67).

13. Pursuant to claim 19 and similarly recited claim 21, wherein the step of identifying the TCC function includes simplifying a complex TCC function into a simplified function having a selected number one or more eigenvalues (Liebchen: ¶12-15; Aleshin: Col. 5, lines 66-67--Col. 6, lines 1-4), and wherein the created interface map has an order depending on a number of eigenvalues selected (Liebchen: ¶12-15; Aleshin: Col. 5, lines 21-28; Col. 6, lines 1-4).

14. Pursuant to claim 20 and similarly recited claim 22, wherein the step of creating the interference map includes convolving the at least impulse function (Liebchen: ¶12; Aleshin: Col. 5, lines 15-20, 36-37, 55-65) using the intended TCC function (Liebchen: ¶7, 9; FIG. 1A; Aleshin: Col. 5, lines 1-20, 50-65).

Response to Arguments

15. The Applicant states:

(a) "...nowhere does Aleshin teach or suggest representing these "transmissive portions" or "primitive elements" as impulse functions as required by the claims"; and

(b) "Aleshin does not explicitly disclose or suggest anything about the claimed step of creating an interference map that, among other things, represents 'areas of destructive interference' either".

Examiner's response:

16. **Regarding (a):** Aleshin teaches mask data is utilized by the aerial simulation technique disclosed in col. 5, as evidenced by FIG. 2: element 44. This data includes points where the pattern will appear on the chip and points where no pattern will appear on the chip (Col. 3, lines 59-62). The points where the pattern will appear on the chip are resolvable features and are represented with an amplitude of one, i.e., impulse response; whereas points where no pattern will appear are represented with an amplitude of zero (Col. 3, lines 59-62).

17. **Regarding (b):** Aleshin teaches creating an aerial image, i.e., interference map, wherein the aerial image represents the printability of resolvable features in terms of areas of light intensity distributions (Col. 4, lines 57-67), i.e., areas of interference.

Conclusion

18. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

19. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Suresh Memula whose telephone number is (571) 272-8046. The examiner can normally be reached on M-F 8am-4:30pm EST. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Chiang can be reached on (571) 272-7483. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

21. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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/Suresh Memula/

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September 26, 2008

/Jack Chiang/
Supervisory Patent Examiner, Art Unit 2825